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**NOTES ON THE OCCURRENCE OF QUARTZ AND OTHER MINERALS IN
THE CHEMUNG MEASURES, NEAR THE LINE OF LYCOMING
AND TIOGA COUNTIES, PENNSYLVANIA.**

BY ABRAHAM MEYER.

Ascending the "Roaring branch" of Lycoming Creek, the upper Catskill measures may be seen. After passing two or three thousand feet of red and gray rocks we reach the upper measures of the Chemung VIII^f and VIII^e. Below, these dip from 10° to 80° beyond which they are nearly horizontal.

In these horizontal strata which rise to heights of from one hundred to three hundred feet above the stream, may be seen peculiar undulations or rolls, some being slight short curves, others semi-circular, while some form an entire circle with the layers concentric. These are most apparent near the base of No. VIII^e, in shales and fossiliferous limestone and iron ore. The rolls differ from the rock, which surrounds them, though the latter follows to a certain extent the convexity of the rolls.

Near one of these rolls a drift was made in search of ore. On the east side appeared a seemingly vertical wall of dark metamorphosed fossiliferous rock of considerable hardness, containing much carbonaceous material and iron pyrites, with cavities holding drusy quartz, calcite, chalcopyrite, etc. On the west side was a soft (pyrophyllite) slate, with calcite and quartz crystals near the line of contact.

In the four or five feet between these was a heterogeneous mixture of hard and soft rocks of varying character, from a soft bluish clay to a very compact quartz resembling novaculite, a breccia together with geodes containing quartz crystals, calcite in the form of dog-tooth spar, pearl spar, chalcocite, chalcopyrite, galena and blende with possibly siderite, fluorite and millerite.

The quartz crystals are generally attached to the rock in the usual manner; some, however, are loose and nearly perfect, often smoky and usually containing remarkable inclusions both solid and liquid. There is much carbonaceous material, quite loose and soiling anything with which it comes in contact. The shale impregnated with this is sometimes metamorphosed into an excessively hard material approaching carbonado in its character.

This material was penetrated for between 40 and 50 feet when the body of the roll was met, dipping about 15°. Here, at the bottom of the drift, on the east side, was a white granular quartz with intermingled quartz crystals some of them rolled. In three feet this increased from a half inch to three inches in thickness accompanied by a harsh silicious carbonaceous rock containing pyrites and chalcopyrite and some steel gray crystals not determined. This seemed to continue, but water coming in, the exploration was abandoned. The quartz crystals exhibited show among other things as follows :

1. A transparent, doubly terminated smoky crystal with a fluid inclusion and also small pearly crystals; also a rectangular and a hexagonal prism beside moss-like aggregates. Near the apex of the pyramidal termination there is a pearly crystal in form resembling a twin of selenite.

In another position, the same crystal shows a vast number of inclusions, some mere points, others fine lines, circles and rosettes, colorless, yellow, orange and black. A group of twelve quartz crystals associated with chalcopyrite and perhaps ilmenite. These under the microscope show octahedral crystals included, with fluid and bubble-containing cavities.

2. Crystals, colorless and transparent, also smoky and some opaque, containing inclusions in fine lines and other figures. These were obtained in a loose blue clay, arising from the decomposition of the soft blue shales of the Chemung formation, and also from a cylindrical chimney, six inches in diameter and two feet long which was found near the top of the drift. The crystals were loose, in a mass of decomposed ferruginous calcite and clay.

3. Similar crystals in ferruginous calcite, found between conglomerate and dolomitic spar in the roll.

4. A white and grayish-white laminated or tabular quartz in quite thin plates, the surface studded with minute quartz crystals with occasional larger transparent or milky crystals.

The slates accompanying these gave evidence by slickensided surfaces of movement under pressure.

5. Quartz crystals upon crystallized calcite and dolomite; the surfaces coated with minute crystals.

6. These occurred with the tabular quartz described above and are in nodular masses of metamorphosed slate and shale. Some crystals are transparent, others dark smoky to black. Some of the

black crystals are much harder than common quartz, and have centers of prismatic colors, which by reflected light assume an asteriated form.

7. Associated also with the tabular quartz is a brownish-red ferruginous quartz one piece of which showed crystals of intense black color, except two zones at the base, which showed prismatic colors, and under the microscope the asterism. The point of this crystal was extremely hard.

8. On a line with the rolls, but 125 feet above them topographically, was ferruginous calcite and massive quartz with rough quartz crystals, the surfaces pitted and filled with clay. The massive quartz breaks very readily into angular fragments, the surfaces coated with dendrites. Some of the crystals are coated with druses of black color and metallic lustre, some crystalline, some quite rough. Under the microscope some of these show crystalline forms of light straw color resembling millerite.

My theory of the formation of these rolls is that a subterranean force acting over an oval area ten or twelve miles by four culminated in making them; the zone of most active force being about two and a half miles in diameter. That steam and water carrying carbon, lime, iron, etc., penetrated the crevices, formed and deposited the minerals and crystals; unfortunately for mining interests this action was scattered over a considerable extent of country whereas had it been confined to a narrow vein, a valuable mine might have been the result.